Example Exam in4046TU

Exercise 1

(a) What is a ccNUMA architecture?

(b) Give four (4) levels of parallelism in parallel computers.

(c) What is an SIMD processor?

(d) Give four (4) different interconnection topologies.

Exercise 2

(a) Give the four (4) phases of mapping a program to a parallel machine. Explain the working of each phase.

(b) What is the function of a barrier in a parallel program?

(c) Why is sending long messages more efficient than short messages in a parallel system?

(d) Given are two tasks T1 and T2 that have to be executed on a system with two processors, where each task is assigned to a different processor. The tasks T1 and T2 might have precedence constraints. How can we enforce the correct sequence of task execution in a Shared Memory system.

Exercise 3

(a) Why do we have to parallelize the Gauss-Seidel iterative process differently than the Jacobi process?

(b) What are the common characteristics of parallelizing the Jacobi, Red-Black SOR, and Conjugated Gradient (CG) methods for solving the Poisson equation?

(c) Given is a two-dimensional grid of n by n points. Suppose that we want to parallelize the Jacobi method by using the domain decomposition method. What is the ratio between communication and computation time of this parallel program?

(d) Give the most important differences between a parallel FFT algorithm with a block distribution and a parallel FFT algorithm with a cyclic distribution.

Exercise 4

(a) What is it that we want to optimize with graph partitioning?

(b) Is the recursive spectral bisection method always to be preferred over the Kernighan-Lin algorithm?

(c) Which computations are the most time consuming in the numerical simulation of an N-body system using the particle-particle method?

(d) Suppose that we efficiently parallelize the computations of the forces on the particles. Is this sufficient for an efficient implementation of the Barnes-Hut algorithm?